IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Takao SUZUKI, Kazuhito SEKI, Shiro SHIBATA and Nobuyuki MATSUSHIMA
Serial No.: 10/551,000
Filed: April 6, 2004
For: COMBINED OIL RING

DECLARATION UNDER 37 CFR 1.132

Honorable Commissioner of Patents and Trademarks,
P. O. Box 1450, Alexandria, VA 22313-1450

Sirs:

I, Shiro SHIBATA, a Japanese citizen, residing at c/o NIPPON PISTON RING CO., LTD., 12-10, Honmachi-Higashi 5-chome, Chuou-ku, Saitama-shi, Saitama 3388503, Japan, hereby declare and state that I am one of the inventing members of the inventions disclosed in the above-entitled patent application.

I declare that I graduated from Department of Mechanical Engineering, College of Engineering at Tamagawa University in March 1991, and that I have been employed by NIPPON PISTON RING CO., LTD. (assignee of the present application) from 1991 and I am now engage in Product Engineering Department I.

I also declare that I have read all of the documents concerning the above-entitled patent application, and am familiar with the contents of the present inventions in this application.

I further declare that the following experiment was conducted by myself and that the result of the experiment is all true and correct to the best of my own knowledge.

PAGE 5/10 * RCVD AT 5/25/2007 6:34:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-5/18 * DNIS:2738300 * CSID:312 427 6663 * DURATION (mm-ss):01-36

[Experiment]

Experiment was conducted in accordance with the following items.

1. Object of Experiment
2. Experiment
3. Evaluation
4. Conclusion

1. Object of Experiment

Experiment was conducted regarding a coil expander which is formed of a shape memory alloy in order to compare the variable tension margin (%) of the coil expander to that of the coil expander formed of the anomaly wire having rectangular cross sectional shape disclosed in the Example section of the specification for US Patent Application No. 10/551,000 (the present application). In this experiment, variation of variable tension margin of the coil expander which is formed by a conventional wire having a circular cross sectional shape was obtained by the same manner as the experiments disclosed in the present application.

2. Experiment

A wire of a shape memory alloy Ti-Ni-based alloy (50 to 51 atom % Ni alloy) having a circular cross sectional shape was used to form a coil expander and its variation of variable tension margin was checked.

The size of the coil expander used in this experiment was the same as that of the sample, with "thickness : width = 1 : 1.00" and having a rectangular cross sectional shape, disclosed in the Example section of the present application. The details of the size are as follow. The figure numbers are based on the numbers used in the Drawings of the present application. In this experiment, the wire used had the circular cross sectional shape. Accordingly, the thickness of the wire = width = diameter of the circle.

PAGE 6/10 * RCVD AT 5/25/2007 6:34:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-5/18 * DNIS:2738300 * CSID:312 427 6663 * DURATION (mm-ss):01-36

- coil diameter (size d7 in FIG. 2) : 1.1 mm
- coil pitch (p in FIG. 2) : 1.0 mm
- the thickness of the cross sectional shape of the wire, width (circle diameter) : 0.37 mm

As spring distortions, the thickness of the cross sectional shape of the anomaly wire (35 in FIG. 3), the coil diameter of the coil expander (d7 in FIG. 2) and shrinkage margin (expander free state - a state in which the coil expander is set to a ring) were set depending on the ring size and tension. The tension of the test sample obtained after martensitic transformation was calculated by the following equation:

(tension after variation - tension before variation) / tension before variation × 100 = variable tension margin (%)

8. Evaluation

Size ratio, coil expander spring distortions, nominal diameters (outer diameter sizes), widths of the oil ring in the axial direction (h1 in FIG. 1) and variable tension margins of the sample used in this experiment are shown in Table 1. The same sample data of the wire, with wire thickness : width = 1 : 1.00 and having rectangular cross sectional shape, used in the Example section of the present application is also shown in Table 1.

[Table 1]

Cross sectional shape of wire	Size ratio			Spring distortion	Nominal diameter (mm)	h1 size (mm)	Variable tension margin (%)
	Thickness	:	Width				
Circular	1	:	1.00	0.983%	79.0	1.5	17.0
Rectangular	1	:	1.00	0.257%	79.0	1.5	24.5

As shown in Table 1, even when wire thickness : width = 1 : 1, the coil expander formed of the wire having rectangular cross sectional shape exhibited more apparent variation in variable tension margin compare to

PAGE 7/10 * RCVD AT 5/25/2007 6:34:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-5/18 * DNIS:2738300 * CSID:312 427 6663 * DURATION (mm-ss):01-36

that of the coil expander formed of the wire having circular cross sectional shape.

4. Conclusion

It is proved from the above-mentioned experimental result that the wire having rectangular cross sectional shape exhibits more apparent variation in variable tension margin than the conventional wire having circular cross sectional shape even when wires of the same thickness, width, coil diameter and pitch are used.

PAGE 8/10 * RCVD AT 5/25/2007 6:34:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-5/18 * DNIS:2738300 * CSID:312 427 6663 * DURATION (mm-ss):01-36

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated this 16th day of May, 2007

Shiro Shibata

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PAGE 9/10 * RCVD AT 5/25/2007 6:34:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-5/18 * DNIS:2738300 * CSID:312 427 6663 * DURATION (mm-ss):01-36